Australian Government

MARL4001A Carry out engineering calculations

Release 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MARL4001A Carry out engineering calculations

Modification History

Release 1
This is the first release of this unit.

Unit Descriptor

This unit involves the skills and knowledge required to carry out calculations related to fuel consumption, fuel storage and engine performance that conform to accepted engineering tolerances.

Application of the Unit

This unit applies to engine workers in the maritime industry working as a Marine Engine Driver Grade 1 on vessels up to 1500 kW.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

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Elements and Performance Criteria

1 Calculate fuel consumption and storage	1.1	Information required for ***calculations related to fuel consumption and storage*** is obtained from relevant sources
	1.2	Calculations are completed to accepted working tolerances
	1.3	Results of calculations are verified
	1.4	Results of calculations are applied to managing fuel as required
2 Complete calculations related to engine performance	2.1	Information required for ***calculations related to engine performance*** is obtained from relevant sources
	2.2	Calculations are performed to accepted working tolerances
	2.3	Results of calculations are verified
	2.4	Results of calculations are applied to managing engine performance as required

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Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required Skills:

- Calculate:
  - area and circumference of a circle
  - consumption of fuel and lubricating oil for a particular voyage, using quantity in litres and mass in tonnes and specified regular shaped tanks
  - distances covered
  - hourly fuel consumption
  - mechanical advantage, load, effort moments
  - pumping capacities for tank filling and emptying
  - remaining steaming times
  - requirements for replenishing lubricating oil in oil tank
  - specific fuel consumption, power, speed and range
  - stress, strain and safe working load
  - tank capacities and pumping capacities for tank filling and emptying
  - theoretical steaming times
  - velocity ratio and efficiency of simple machines
  - volume and capacity of regular shaped tanks
- Convert:
  - fractions to decimals
  - units to multiples of base units
- Use calibration tables to measure quantities in tanks
- Use relative density/specific gravity to convert quantity in litres and volume

Required Knowledge:

- Area and circumference of a circle
- Calibration tables
- Common SI units such as kilogram, tonne, Newton, Newton metre, Pascal, joule, watt and metre
- Relationship between theoretical vessel speed, propeller pitch and RPM
- Terminology of:
  - simple levers
  - material technology
- Volumes of regular shaped tanks
- Work health and safety (WHS)/occupational health and safety (OHS) requirements and work practices

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Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, the required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the Elements, Performance Criteria, Required Skills, Required Knowledge and include:

- accurately calculating voyage fuel requirements
- performing accurate and reliable calculations.

Context of and specific resources for assessment

Performance is demonstrated consistently over time and in a suitable range of contexts.

Resources for assessment include access to:

- industry-approved marine operations site where carrying out engineering calculations can be conducted
- tools, equipment and personal protective equipment currently used in industry
- relevant regulatory and equipment documentation that impacts on work activities
- range of relevant exercises, case studies and/or other simulated practical and knowledge assessments
- appropriate range of relevant operational situations in the workplace.

In both real and simulated environments, access is required to:

- relevant and appropriate materials and equipment
- applicable documentation including workplace procedures, regulations, codes of practice and operation manuals.

Method of assessment

Practical assessment must occur in an:

- appropriately simulated workplace environment and/or
- appropriate range of situations in the workplace.

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate to this unit:

- direct observation of the candidate carrying out engineering calculations
- direct observation of the candidate applying relevant WHS/OHS requirements and work practices.

Guidance information for assessment

Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

In all cases where practical assessment is used it should be

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	combined with targeted questioning to assess Required Knowledge. Assessment processes and techniques must be appropriate to the language and literacy requirements of the work being performed and the capacity of the candidate.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below.

Calculations related to fuel consumption and storage must include:	• Calculations involving:
	  • specific fuel consumption
	  • volume and capacity of regular shaped tanks
	  • pumping capacities for tank filling and emptying
	  • consumption of fuel and lubricating oil
	  • hourly fuel consumption
	• Hourly fuel consumption
	• Requirements for replenishing lubricating oil in oil tank
	• Using calibration tables to measure quantities in tanks
	• Using relative density/specific gravity to convert quantity in litres and volume to mass

Calculations related to engine performance must include:	• Calculations involving:
	  • theoretical steaming times
	  • distances covered
	  • specific power, speed and range
	  • theoretical steaming times
	  • mechanical advantage, load, effort moments
	  • stress, strain and safe working load
	• Remaining steaming times

Unit Sector(s)

Not applicable.

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Competency Field

Marine Engineering

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